

REMARKS

In the Office Action mailed August 10, 2001, claims 1, 5, 7, 8-13 were rejected under 35 USC 102(b) as being anticipated by Lyon (U.S. Patent No. 5,675,665); claim 2 was rejected 35 USC 103(a) as being unpatentable over Lyon; claims 3 and 6 were rejected under 35 USC 103(a) as being unpatentable over Lyon in view of Kimura et al. (Pattern Recognition Journal 7; Improvement of Handwritten Japanese Character Recognition Using Weighted Direction Code Histogram); and claim 4 was rejected under 35 USC 103(a) as being unpatentable over Lyon and further in view of Kimura et al., and Tsuruoka et al. (IEEE Paper ISBN: 0-8186-4960-7; Segmentation and Recognition for Handwritten 2-Letter State Names). The foregoing rejections are respectfully traversed.

Claims 1-13 are pending in the subject application, of which claims 1, and 9-13 are independent claims. Claims 2-8 depend, either directly or indirectly, from claim 1.

Claims 1, 3, and 9-13 are amended. Care has been exercised to avoid the introduction of new matter. A Version with Markings to Show Changes Made to amended claims 1-3 is included herewith.

Lyon relates to the division of a word, the extraction of a character from the word, and the recognition of the character. Moreover, Lyon performs character recognitions over characters extracted from a recognition target for the purposes of generating bounds model pairs to which the recognition target is compared.

Kimura et al. employs a two-dimension Gaussian filter, and gradating conversion is performed over two directions, perpendicular and horizontal. The Examiner's assertions that Kimura et al. describes a one-dimension gradating conversion are respectfully traversed.

Tsuruoka discloses a splitting algorithm for 2-letter state names, but splitting along a vertical line. Tsurouka also discloses the use of the splitting algorithm for connected zip code splitting.

The combination of Lyon and Kimura is the division of a word, the extraction of a character from the word, and the recognition of the character, employing a two-dimension Gaussian filter, and gradating conversion is performed over two directions, perpendicular and horizontal.

The combination of Lyon, Kimura, and Tsurouka is the division of a word, the extraction of a character from the word, and the recognition of the character, employing a two-dimension Gaussian filter, and gradating conversion is performed over two directions, perpendicular and horizontal, while employing a splitting algorithm.

In contrast to the foregoing references relied upon, taken either alone or in combination, the present invention takes a word as a whole as a recognition target instead of extracting characters as individually separated characters and subjecting them to a character-by-character recognition process. Moreover, in the present invention, a feature amount is generated dynamically based on a word list. In the system of the present invention, a word list, containing candidate words having been preliminarily registered, is provided and the feature amount of a word which is to be collated to a recognition target is generated dynamically by referring to the word list. Use of information contained in the word list by referring to it in such a way leads to a reduction in the number of candidate words with which a recognition target word needs to be collated, and thus to an improved accuracy of the recognition.

Also in contrast to the foregoing references relied upon, the present invention avoids performing a gradating conversion in the direction in which characters are connected to each other so that the feature amounts of respective characters contained in a word are assembled easily.

Claims 1, and 9-13 of the present application each recites (using the recitation of claim 1 as an example) a generating unit "referring to the list stored in said listing unit, dynamically generating a feature amount of a word registered in the list using the feature amounts of characters stored in said dictionary unit during a recognition process for a recognition target, which is not divided in units of characters" and a collating unit "collating the generated feature amount of the word with a feature amount of the recognition target, and outputting a recognition result".

Moreover, claim 3 of the present application recites "an extracting unit performing a one-dimensional gradating conversion in a direction perpendicular to a connecting direction of characters for a direction code histogram of a contour line in each of a plurality of small areas in an inputted image provided that no gradating conversion is performed in the connecting direction of the characters, and extracting a direction code histogram series obtained from a conversion result as the feature amount of the recognition target".

In addition, dependent claims 2-8 recite patentably distinguishing features of their own. For example, claim 2/1 recites "said collating unit includes a memory storing the feature amount of the word, and releases the memory when a collation of the feature amount of the word is completed".

Withdrawal of the foregoing rejections is respectfully requested.

CONCLUSION


There being no other objections or rejections, it is submitted that the application is in condition for allowance, which action is earnestly solicited.

If any further fees are required in connection with the filing of this Amendment, please charge same to our Deposit Account No. 19-3935.

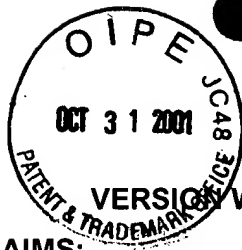
Respectfully submitted,

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IN THE CLAIMS:

Please AMEND the claims as follows:

1. (TWICE AMENDED) A word recognizing apparatus, comprising:
a listing unit storing a list of at least one candidate word;
a dictionary unit storing feature amounts of a plurality of characters;
a generating unit referring to the list stored in said listing unit, dynamically generating a feature amount of a word [stored in said listing unit] registered in the list using the feature amounts of characters stored in said dictionary unit during a recognition process for a recognition target, which is not divided in units of characters; and
a collating unit collating the generated feature amount of the word with a feature amount of [a] the recognition target, and outputting a recognition result.
- 2 (As Once AMENDED) The word recognizing apparatus according to claim 1, wherein said collating unit includes a memory storing the feature amount of the word, and releases the memory when a collation of the feature amount of the word is completed.
3. (TWICE AMENDED) The word recognizing apparatus according to claim 1, further comprising:
an inputting unit inputting an image as the recognition target; and
an extracting unit performing a one-dimensional [graduating] gradating conversion in a direction perpendicular to a connecting direction of characters for a direction code histogram of a contour line in each of a plurality of small areas in an inputted image provided that no gradating conversion is performed in the connecting direction of the characters, and extracting a direction code histogram series obtained from a conversion result as the feature amount of the recognition target.
4. (As Once AMENDED) The word recognizing apparatus according to claim 3, wherein said extracting unit divides a length of the inputted image in the direction perpendicular to the connection direction of characters by a predetermined integer and divides the image into

the small areas with an obtained quotient as a size of each of the small areas.

5. (As Once AMENDED) The word recognizing apparatus according to claim 1, wherein said generating unit generates the feature amount of the word by using feature amounts of a plurality of characters.

6. (As Once AMENDED) The word recognizing apparatus according to claim 5, wherein said generating unit generates a new direction code histogram series by arranging a plurality of direction code histogram series corresponding to the feature amounts of characters composing the word and designating a generated direction code histogram series as the feature amount of the word.

7. (As Once AMENDED) The word recognizing apparatus according to claim 1, wherein said collating unit performs a non-linear matching of the feature amount of the word and the feature amount of the recognition target, and calculates a degree of similarity between the feature amount of the word and the feature amount of the recognition target.

8. (As Once AMENDED) The word recognizing apparatus according to claim 1, wherein said listing unit stores a list which has a high possibility of containing a word corresponding to the recognition target.

9. (TWICE AMENDED) A word recognizing apparatus, comprising:
a generating unit referring to a list of at least one recognition candidate word,
dynamically generating a feature amount of a recognition candidate word registered in the list using feature amounts of characters during a recognition process for a recognition target, which is not divided in units of characters; and

a collating unit collating the generated feature amount of the word with a feature amount of [a] the recognition target, and outputting a recognition result.

10. (TWICE AMENDED) A recognizing apparatus, comprising:
a generating unit referring to a list of at least one recognition candidate pattern

string, dynamically generating a feature amount of a recognition candidate pattern string registered in the list using feature amounts of patterns during a recognition process for a recognition target, which is not divided in units of characters; and

a collating unit collating the generated feature amount of the pattern string with a feature amount of the recognition target, and outputting a recognition result.

11. (TWICE AMENDED) A computer-readable storage medium on which is recorded a program causing a computer to execute a process, said process comprising:

dynamically generating by referring to a list of at least one recognition candidate word a feature amount of a recognition candidate word registered in the list using feature amounts of characters during a recognition process for a recognition target, which is not divided in units of characters; and

collating the generated feature amount of the word with a feature amount of [a] the recognition target.

12. (TWICE AMENDED) A computer-readable storage medium on which is recorded a program causing a computer to execute a process, said process comprising:

dynamically generating by referring to a list of at least one recognition candidate pattern string a feature amount of a recognition candidate pattern string registered in the list using feature amounts of patterns during a recognition process for a recognition target, which is not divided in units of characters; and

collating the generated feature amount of the pattern string with a feature amount of [a] the recognition target.

13. (TWICE AMENDED) A recognizing method, comprising:
generating a list of at least one candidate pattern string;
generating a dictionary for storing feature amounts of a plurality of patterns;
dynamically generating by referring to the list a feature amount of a pattern string [stored] registered in said list using feature amounts of patterns stored in said dictionary during a recognition process for a recognition target, which is not divided in units of characters ; and

collating the generated feature amount of the pattern string with a feature amount of
[a] the recognition target.